Impact of COVID-19 on food processing and supply chain

Adeoye J. T.
Cyprus International University, Cyprus.

ABSTRACT

Coronavirus disease 2019 (COVID-19) is a clinical condition caused by the coronavirus-2, which causes extreme acute respiratory syndrome (SARS-CoV-2). The World Health Organization (WHO) declared COVID-19 a pandemic on March 11, 2020, due to its rapid spread across many countries, as well as its high mortality rate among the elderly and infirm. Pandemics are known for their devastating effect on the global economy. COVID-19 has been observed to have an impact on the entire process in food processing and supply chain (from the field to the consumer) which is one of the most important sectors of the economy. Workers' movement constraints, changes in market demand, the closing of food processing facilities, limited food trade policies, and financial strains in the food supply chain were all consequences of COVID-19. There is now considerable concern regarding food production, manufacturing, distribution, and demand. To avoid a rise in food prices, food protectionist policies should be avoided, governments should make it easier for workers and agricultural products to move around. By modifying safety measures, facilities should improve working conditions while also protecting employees' health and safety. Cleaning, sanitation, good hygiene practices, and active packaging are also required from farm to consumer. The goal of this review is to assess the impact of COVID-19 on agriculture and food production, as well as to summarize the recommendations needed to mitigate and control the pandemic's impact.

Key words: *pandemic; COVID-19; agriculture; food; supply chain.*

Introduction

Covid'19 was first discovered in patients with atypical viral pneumonia in Wuhan, Hubei, China in December 2019 (Kaul, 2020; Naserghandi *et al*., 2020; Petrosillo *et al*., 2020). The WHO initially termed the virus 2019 novel coronavirus (2019-nCoV), but after it was discovered that 86.9% of the novel virus genome was similar to the SARS-CoV genome, it was renamed SARS-CoV-2 (Chang *et al*., 2020; The Lancet Infectious Diseases, 2020).

COVID-19 is a respiratory disease characterized by symptoms ranging from moderate influenza (flu-like) to severe pneumonia and acute respiratory distress syndrome, which is caused by SARS-CoV-2 infection (Petrosillo *et al*., 2020). COVID-19's clinical symptoms are non-specific and vary between patients and nations. Fever, sore throat, runny or stuffy nose, dry cough, headache, myalgia or weariness, sputum production, dyspnea, chest pain or pressure, joint discomfort, chills, loss of taste or smell, and a rash on the skin or discoloration of toes or fingers are all common COVID-19 symptoms. Less common symptoms include abdominal pain, dizziness, diarrhea, nausea, and vomiting (Kaul, 2020; Naserghandi *et al*., 2020; Petrosillo *et al*., 2020). Fever (82 percent), cough (61%), muscle pains and/or fatigue (36%), dyspnea (26%), headache (12%), sore throat (10%), and gastrointestinal symptoms (9%) were reported among 59,254 patients in 61 studies by Borges do Nascimento *et al*. (2020).

The incubation period for a patient to display symptoms after infection is an average of 5-6 days but it can take up to 14 days according to World Health Organization (WHO), 2020. COVID-19 virus is extremely contagious, and practically every country has now reported cases and deaths. COVID-19 was declared a pandemic by the World Health Organization on March 11, 2020. COVID-19 has been linked to about 12 million confirmed patients and 550,000 deaths worldwide as of early July (WHO, 2020).

As consequence of the COVID-19 crisis, response plans for food workers were developed to provide guidance for continuity of operations in food processing facilities and manage coronavirus in the food industry. The plan includes a hierarchy of control requirements for cleaning, sanitation, disinfection of facilities, screening and monitoring of workers for COVID-19, managing the sick employees and education programs for workers and supervisors to prevent the spread of coronavirus (CDC, 2020).

A key worry shared by all food companies is maintaining employee health and ensuring a sufficient workforce because of those who do not want to work due to illness or fear of the coronavirus. During this time of crisis, it is critical to preserve and sustain the health of those working in the food processing industries and supply chain (FAO and WHO, 2020).

Effects of pandemic on food processing and supply chain

COVID-19 is a respiratory infection for which there is no proof that food is a transmission vector (ICMSF, 2020). However, the virus's spread and the actions taken to reduce it spread have consequences on food processing, nutrition, and supply chain. In a number of countries, initial and continued uncertainties about the nature of COVID-19's spreading led to the implementation of strict lockdown and physical distance rules. These actions slowed economic growth and disrupted supply chains, triggering new dynamics with cascading impacts on food systems and people's food security and nutrition. These dynamics are outlined below

Food and supply chain disruptions

Food processing and supply chains have been severely disrupted as a result of the lockdown measures, affecting food availability, pricing and quality (Barrett, 2020). Due to the closure of restaurants and other food service facilities, demand for perishable commodities such as dairy products, potatoes, fresh fruits and meat has dropped drastically (Lewis, 2020; Terazono and Munshi, 2020). There were widespread media reports of food goods being thrown or ploughed back into the fields when pandemic-related lockdowns took hold in numerous nations between March and May 2020 due to either fallen demand or difficulty in delivering these foods to markets (Yaffe-Bellany and Corkery, 2020). Farmers that lacked proper storage facilities (especially cold storage) found themselves with surplus produce. Food supply chains were also disrupted as a result

of high rates of illness among food system personnel, which led in the closure of some food processing facilities, such as meat packing plants (CFS, 2020; Stewart *et al*., 2020). COVID-19 has had a particularly negative impact on food system workers, particularly those who work in labor-intensive food production, those who rely on migrant farmworkers who face travel barriers and often work in cramped conditions on farms and in food production facilities, some of which have had to close temporarily to contain outbreaks (Haley *et al*., 2020).

Altering food environments

The pandemic has had a significant impact on food environments. Lockdown measures and supply chain disruptions outlined above have changed the context and thus the way people engage and interact with the food system to acquire, prepare and consume food. People who relied on foods made outside the home for their meals suddenly found themselves preparing food at home as eateries and food vendors closed. Foods that were previously produced and packaged exclusively for food service were not easily repackaged for retail sale and home consumption due to supply chain rigidities. As the COVID-19 epidemic spread, many countries attempted to close down informal food markets, which governments identified as possible disease transmission hotspots, illustrating a formality bias in public health and food policy (Battersby, 2020). In underdeveloped countries like Nigeria, informal marketplaces are critical sources of food and livelihood (Young and Crush 2019). In South Africa, formal food retail outlets that sell processed and packaged foods were allowed to remain open, while informal and open-air food markets, which sell more fresh fruits and vegetables, were closed (despite the fact that open-air markets are actually safer in terms of person-to-person transmission (Moseley and Batt, 2020). Poor people, who are more reliant on such markets for food (because they can buy produce and foodstuffs in smaller quantities) were most affected by this decision. Differentiated responses have emerged in

response to this situation. Poor households are more likely to shift their expenditures away from fresh fruits and vegetables with high micronutrient content and toward less nutrient-dense staple foods as a direct effect of the pandemic. (Laborde, Martin and Vos, 2020).

Meat, fruit, vegetable, dairy, ready-to-eat foods, and other consumable items are all part of the food industry (Hueston and McLeod, 2012). However, in terms of capital investment and labor, the food and agriculture chain can be divided into two types. The first category includes items like wheat, corn, maize, soybeans, and oilseeds. The Second one contains high-value products such as fruit, vegetables, and fisheries. The supply chain affects not only producers, distributors, and consumers, but also food-processing plants that are labour intensive. Production was reduced, suspended, or temporarily discontinued in many plants due to the workers who were found to be COVID-19 positive and who were reluctant to go to work, thinking that they would get sick at work at the time of the outbreak. For these reasons, it was thought that the production capacity of food processing industries decreased by approximately 25% in late April (Devereux *et al.*, 2020; Flynn, 2020).

Effects of pandemic on global food trade

Trading allows products to flow from surplus to deficit areas, avoiding shortages and food insecurity caused by sole reliance on domestic production (Baldos and Hertel, 2015; Fitton *et al*., 2019). However, due to export limitations, the COVID-19 pandemic had a substantial impact on food trade and caused a disruption in the food supply chain. Export restricted policy pushed up world prices of stable agricultural commodities like wheat, maize, and rice, resulting in a decrease in the quantity and quality of food consumed (Fyles and Madramootoo, 2016). Customers were also unable to locate a product that was not grown or produced locally. Restrictions also harmed manufacturers because international market has an infinite number of buyers, making it easier for

them to choose the best one. When export restrictions were implemented, local sellers were unable to locate buyers and resulting in excess supply, waste and economic losses. Due to the restrictions, foods that are cultivated locally but required processing were unavailable and the capacity utilization of food-manufacturing plants to meet demand was also affected (Arianina and Morris, 2020).

Recommendations to minimize the effect of Covid-19

COVID-19 outbreak poses a major threat to food security, nutrition, and safety. Economic access and physical availability of food are also threatened by the pandemic's economic instability. In some regions and at certain times, disruptions and potential problems in marketing, logistics, and trade systems may limit access to food, resulting in hunger and malnutrition issues (FAO, 2020). According to a World Food Program report, the number of people facing acute hunger might rise to 265 million by 2020 as a result of Covid'19. (WFP, 2020).

Food Supply Chain

One-third of all food produced for human consumption was lost or wasted through the food supply chain stages of production, postharvest handling, processing, distribution, and consumption prior to the pandemic. As a result, in the era of the coronavirus, food waste has received greater attention than ever before. Food is not a source of coronavirus and the virus cannot be spread by food consumption (European Food Safety Authority) however, surfaces contaminated with the COVID-19 virus, such as doorknobs, light switches or plates provide risk of infection (EC, 2020). It can be easily spread via air, according to Richard *et al*. (2020). As a result, people should always wash their hands when handling food and shops must adhere to strict sanitary standards.

Human resource management was more challenging as a result of the COVID-19 epidemic. Changes in working conditions, new workplace policies and measures to reduce human contact

are among the challenges (Carnevale and Hatak, 2020). As a result, companies should take certain steps to address the difficulties. Personnel, visitors, suppliers, and contractors should be screened for COVID-19 symptoms before entering the workplace, and all employees should have their temperatures taken. It's also crucial to keep an eye on workers to make sure they're wearing face protection and gloves. Organisation/industries should think about working hour's reductions and personnel rotation to avoid overcrowding. Finally, warehouses and processing plants should be constructed to allow implementation of social distances by personnel. Constructing borders or barriers if possible to preserve social distance by covering the top half of the body of workers.

Need for Food Hygiene Practices from Farm to Fork

As mentioned, COVID-19 virus has an ability to stay alive for up to 72 h as a virion on inanimate objects after completing its life cycle in the body of an infected person (Van Doremalen *et al*., 2020). Therefore, if the respiratory discharges of the COVID-19 patient come in contact with food, the food items can become a fomite (carrier), and if these items are contacted by other individuals, the virus is more likely to gain entry to their respiratory epithelium when unsanitized hands touch the nose, eyes, and mouth (Bundesinstitut für Risikobewertung, 2020; Centers for Disease Control and Prevention (CDC), 2020). The surfaces of utensils, packaging material, counters, conveyor belts, interiors of transport vehicles, and all other food work stations where there might be human contact with food should remain a focus of attention where food handlers can act to impede the spread of COVID-19. Therefore, the proper use of personal protective equipment and adherence to the guidelines issued by public health authorities which include regular hand washing when exchanging goods plus the use of hand sanitizers, wearing masks and gloves, and social distancing (maintenance of at least 6 feet between personnel) are very important. A range of disinfectants and sanitizers are available in the marketplace.

Food Delivery

During an outbreak, it is recommended that people have as little interaction as possible; consequently, online meal deliveries are preferable. These provide for a physical separation between the customer and sales personnel. At this point, proper food handling procedures information must also be disseminated. Because food packages and paper currency are exchanged between consumers and retailers, adequate safeguards are required to reduce the risk of viral transmission. Some third-party delivery companies have also started providing contact-free home delivery. After keeping note of the important information on the packaging, it can be discarded. The right use of gloves, sanitizers, and disinfectants can help to reduce the risk of disease transmission and virus spread (Food and Agriculture Organization of the United Nations [FAO] and World Health Organization [WHO], 2020; Food and Drug Administration [FDA], 2020).

Appropriate policies for food sub-sector

Government agencies and industry associations should provide assist food processing and supply chain industries to help them cope with COVID-19, by providing information on best practices for safety and hygiene and stabilising market conditions. Other policy measures that can protect the functioning of food supply chains included exemptions of food and agriculture from lockdown restrictions, measures to ensure the health of agriculture and food workers, loosening visa restrictions to attract foreign seasonal workers and administrative flexibility.

Conclusions

During a pandemic, continuing the flow of the supply in agriculture and food sector which is one of the most important sectors together with health, is vital to prevent the food crisis and reducing the negative impact on the global economy. As a result, each country has to realize the

severity of the situation and sometimes should tighten or loosen the measures according to the spread of the pandemic. The food processing and supply chain industries also should be flexible enough to respond to the challenges in the food supply chain.

References

Arianina, K., Morris, P. (2020). COVID-19 Export Restrictions Threaten Global Food Supply [Online].https://www.squirepattonboggs.com/-/ media/files/insights/publications/2020/05/covid-19-export-restrictionsthreaten- global-food supply/law360covid19exportrestrictionsthreatenglo balfoodsupply.pdf. Accessed on Jul. 24, 2020.

Baldos, U. L. C., Hertel, T. W. (2015). The role of international trade in managing food security risks from climate change. *Food Security*, 7: 275–290.

Battersby, J. (2020). 'Looking Backward to Go Forward' in *Gastronomica: Journal of Critical Food Studies* Spring 2020 19-20.

Borges do Nascimento, I. J., Cacic, N., Abdulazeem, H. M., von Groote, T. C., Jayarajah, U. and Weerasekara, I. (2020). Novel coronavirus infection (covid- 19) in humans: a scoping review and meta-analysis. J. Clin. Med. 9:941. doi: 10.3390/jcm9040941.

Bundesinstitut für Risikobewertung [BfR] (2020). Can The New Type Of Coronavirus Be Transmitted Via Food And Objects?. Available online at: https://www.bfr.bund.de/en/can_the_new_type_of_coronavirus_be_transmitted_via_food_and_objects_-244090.html (accessed April 29, 2020).

Carnevale, J. B. and Hatak, I. (2020). Employee adjustment and well-being in the era of COVID-19: implications for human resource management. *Journal of Business Research*, 116: 183–187.

CDC (Centers for Disease Control and Prevention). (2020). Agriculture Workers & Employers [Online]. https://www.cdc.gov/coronavirus/2019- ncov/community/guidance-agricultural-workers.html. Accessed on Aug. 5, 2020.

Chan, J. F. W., Yuan, S., Kok, K. H., To, K. K. W., Chu, H. and Yang, J. (2020). A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster. Lancet 395, 514–523. doi: 10.1016/s0140-6736(20)30154-9.

Devereux, S., Béné, C., Hoddinott, J. (2020). Conceptualising COVID-19's impacts on household food security. *Food Security*, 12: 769–772.

Environmental Protection Agency (2020). List N: Disinfectants For Use Against SARS-CoV-2. Washington, DC: Environmental Protection Agency.

FAO (Food and Agriculture Organization of the United Nations), WHO (World Health Organization). (2020). COVID-19 and Food Safety: Guidance for food businesses: Interim guidance [Online]. http://www.fao.org/3/ ca8660en/CA8660EN.pdf. Accessed on Apr. 17, 2020.

Food and Drug Administration [FDA] (2020a). Food Safety and the Coronavirus Disease 2019 (COVID-19). White Oak Campus: FDA.

Fitton, N., P. Alexander, N. Arnell, B. Bajzelj, K. Calvin, J. Doelman, J.S. Gerber, P. Havlik, (2019). The vulnerabilities of agricultural land and food production to future water scarcity. *Global Environmental Change* 58: 101944.

Flynn, D. (2020). CDC provides first guidance to a specific meat plant for combating COVID-19 among employees [Online]. https://www. foodsafetynews.com/2020/04/cdc-provides-first-guidance-to-a-specificmeat- plant-for-combating-covid-19-among-employees/. Accessed on May 1, 2020.

Haley, E., Caxaj, S., George, G., Hennebry, J., Martell, E. and McLaughlin , J. (2020). Migrant Farmworkers Face Heightened Vulnerabilities during COVID-19. *Journal of Agriculture, Food Systems, and Community Development*, *9*(3), 35-39. https://doi.org/10.5304/jafscd.2020.093.016

Hueston, W., and McLeod, A., (2012). Overview of the global food system: changes over time/space and lessons for future food safety. In: Institute of Medicine (US). Improving Food Safety Through a One Health Approach:Workshop Summary. National Academies Press (US), Washington (DC), page.

Kaul, D. (2020). An overview of coronaviruses including the SARS-2 coronavirus - Molecular biology, epidemiology and clinical implications. Cur. Med. Res. Pract. 10, 54–64. doi: 10.1016/j.cmrp.2020.04.001

Kaur, G. (2020). Meat Plants Become Hotspots for Covid-19 Across the World [Online]. https://www.grainmart.in/news/meat-plants-become-hotspotsfor-covid-19-across-the-world/. Accessed on Jul. 3, 2020.

Laborde, D. and Rob Vos (2020). Science 31 Jul 2020: Vol. 369, Issue 6503, pp. 500-502 DOI: 10.1126/science.abc4765

Moseley, W.G. & Battersby, J. 2020. The Vulnerability and Resilience of African Food Systems, Food Security and Nutrition in the Context of the COVID-19 Pandemic. African Studies Review, 63(3).

Naserghandi, A., Allameh, S. F., and Saffarpour, R. (2020). All about COVID-19 in brief. New Microb. New Infect. 35:100678. doi: 10.1016/j.nmni.2020.100678

OECD (The Organisation for Economic Co-operation and Development).(2020). Managing international migration under COVID-19

[Online].http://www.oecd.org/coronavirus/policy-responses/managinginternational-migration-under-covid-19-6e914d57/. Accessed on Aug. 5, 2020.

Petrosillo, N., Viceconte, G., Ergonul, O., Ippolito, G., and Petersen, E. (2020). COVID-19, SARS and MERS: are they closely related? Clin. Microbiol. Infect. 26, 729–734. doi: 10.1016/j.cmi.2020.03.026

Shahbaz, M., Bilal, M., Akhlaq, M., *et al.* (2020). Strategic measures for foodprocessing and manufacturing facilities to combat Coronavirus Pandemic (COVID-19). *Journal of Pure and Applied Microbiology*, 14: 1087–1094.

Stewart, A., Kottasova, I. and Khaliq, A. (2020). Why meat processing plants have become Covid-19 hotbeds [Online]. https://edition.cnn.com/2020/06/27/ health/meat-processing-plants-coronavirus-intl/index.html. Accessed on Jul. 3, 2020.

Terazono, E. and Munshi, N. (2020). Choc waves: how coronavirus shook the cocoa market. Financial Times, July 30. (also available at https://www.ft.com/content/37aa0ac8-e879-4dc2- b751-3eb862b12276).

The Lancet Infectious Diseases (2020). Challenges of coronavirus disease 2019. Lancet Infect. Dis. 20:261. doi: 10.1016/s1473-3099(20)30072-4

Van Doremalen, N., Bushmaker, T., Morris, D. H., *et al.* (2020). Aerosol and surface stability of SARS-CoV-2 as compared with SARS-CoV-1. *New England Journal of Medicine*, 382: 1564–1567.

World Health Organization [WHO] (2020). Coronavirus Disease (COVID-19) Pandemic. Geneva: WHO.

Yaffe-Bellany, D., Corkery, M. (2020). Dumped milk, smashed eggs, plowed vegetables: Food waste of the pandemic. The New York Times.https://www.nytimes.com/2020/04/11/business/ coronavirus-destroying-food.html

Young, G. and Crush, J. (2019) Resituating Africa's urban informal food sector. Urban Forum, 30(4), pp. 377-384. (doi:10.1007/s12132-019-09374-4)